superseded, and the helm-port, or opening in the centre, where the rudder-head enters, is so reduced, that the old dangerous rudder-coat of canvass or leather — a very insufficient barrier to the breaking through of seas and swamping of the ship—is now dispensed with, and woodwork, called canting, is substituted.

In the rudder of the model, regard has been had to that which is deemed the best shape, and also to the best disposal and adaptation of the timber usually employed in forming rudders. Thus, in the fore-part, where deep cutting or gulleting is required, elm is preferred. The main piece is of oak; and, in order to give buoyancy to the whole, the backing-piece, or after-part, is of fir.

No. X

STRENGTHENING THE TOP-SIDES AND DECKS OF SHIPS.

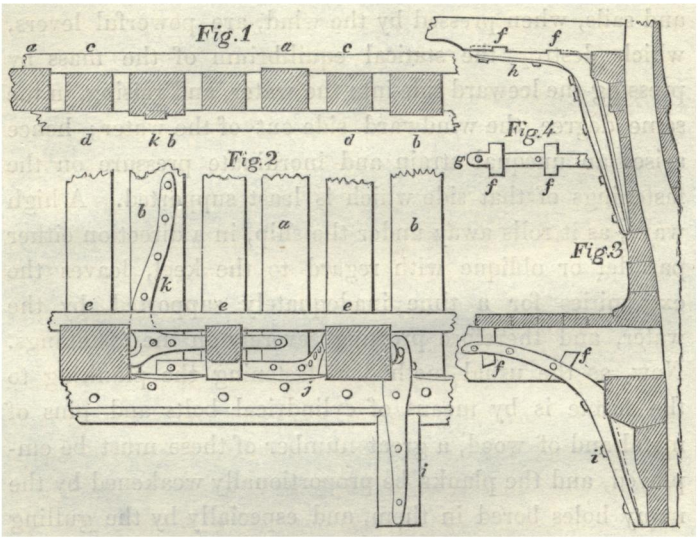
The LARGE GOLD MEDAL *was presented to Mr.* WILLIAM HOOKEY, 6 *Prospect Place, Lower Road, Deptford, for his Method of Strengthening the Top-sides and Decks of Ships; a Model of which has been placed in the Society's Repository.*

THE different pieces that compose the frame of a ship are in equilibrium only when the vessel is floating in calm water; but at sea a ship is exposed to the partial action of forces which have a strong tendency to disunite the

framing, and to bend or break the bolts and treenails by which the planking is fastened to the frame. The masts and sails, when pressed by the wind, are powerful levers, which destroy the statical equilibrium of the mass by pressing the leeward side into the water, and raising, in the same degree, the windward side out of the water; hence arises an unequal strain and inordinate pressure on the fastenings of that side which is least supported. A high wave, as it rolls away under the ship, in a direction either parallel or oblique with regard to the keel, leaves the extremities for a time inadequately supported by the water, and therefore pressing severely on the fastenings. Now, as the usual method of fastening the planking to the frame is by means of cylindrical bolts and pins of metal and of wood, a great number of these must be employed, and the planks be proportionally weakened by the many holes bored in them, and especially by the gulling of those holes (by the causes already mentioned) into which metal bolts have been driven.

Mr. Hookey considerably reduces the number of the bolts and treenails, and provides more effectually for the strength of the fabric. This he does with regard to the top-side by making every fourth timber, from the wales upward, somewhat thicker than the others, and to project outwards from half an inch to an inch, according to the size of the ship, and also every fourth timber to project inwards in the same degree The timbers that project outwards are of course not the same as those which project inwards, but are alternate ones, as shewn in fig. 1. in which the line of shaded squares represents a horizontal section of part of the timbers. Those opposite to *a* and *a* are the timbers that project outwards, and those opposite *b* and *b* are the timbers that project inwards. The alter-

nate outside planks *c c* are scored to receive the former

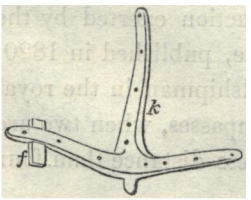


timbers, and the alternate inside planks *d d* are similarly scored to receive the latter timbers. The individual strength of these scored planks is necessarily reduced by the proportion which the depth of the score bears to the thickness of the plank; but half the planks retain their original thickness, and the distance between timber and timber is so little that no real diminution of strength occurs from this cause. The advantages of scoring half the planks are very great; for any force applied to dislocate the timbers laterally is now resisted by the cohesion of the wood between the scores, so that all lateral motion of them becomes nearly impossible, while the strain is taken off from the treenails and bolts.

In like manner, the deck-beams are prevented from moving by scoring the deck-planks, as shewn in fig. 2,

which represents a section of three of the deck-beams, with a scored plank *e e e* lying upon them; *a* and *b b* being longitudinal views of the top-side timbers, sections of which are designated by the same letters in fig. 1.

The top-sides and decks being thus made nearly immovable, as far as regards the relative position of their respective component parts, the next object with Mr. Hookey was so to connect them as to make them nearly immovable with regard to each other, and to prevent the athwartship racking. This is done by the introduction of iron standards, which, being let into the deck-beams, abut very securely against the grain of the wood. An improved method of fitting and securing the lodging-knees is also introduced, whereby the fastenings are greatly relieved, and the strain thrown more on the knees themselves, which are made of bar-iron. In fig. 3, *i* is one of these standards, with cross-plates *f f*, which are let into the deck-beams, and, by their bearing against the grain of the timbers, resist all change of place. *i*, in fig. 2, shews the same standard, but in a position at right angles to the former. In fig. 3 is another iron knee, the upper part of which is represented at right angles with the former in fig. 4. In this it is seen how the cross-bars *f f* and the head *g* are let into and abut against the deck-beams. *j*, fig. 2, is a horizontal knee, let both into the timbers and into the deck-beams. *k*, fig. 2, is a three-armed knee, shewn separate in the annexed figure, the upper arm of which is lodged in a scoring made both in the timber and in the inner plank, as appears from the section at *k*, fig. 1.



The above are the means by which Mr. Hookey prevents, in the first place, all motion on each other of the pieces composing the top-side as well as the deck of a ship, and likewise, by the manner in which the iron standards and knees are lodged, unites nearly immovably the deck and top-sides; the consequence of which is, that all, or nearly all, lateral strain is taken away from the bolts and treenails; and thus the whole fabric becomes far stronger and better united than it is in ships of the common construction.

No. XI.

SLIDING SHIPS' COMPASS.

The Sum of FIVE POUNDS *was presented to Mr. W.* POPE, *of Ball Alley, Cornhill, for his Sliding Ships' Compass.*

TILL of late years, ships' binacles were almost universally furnished with two compasses, in order that, on whatever side of the ship the steersman at the time happened to be, he might obtain a direct view of the compass. But in small binacles this inconvenience happened—that the needles of the two compasses mutually attracted each other, and thus introduced an error, often of very serious magnitude, in the indication of the compass. This circumstance is noticed in a work on the local attraction exerted by the iron in a ship on the magnetic needle, published in 1820, by Mr. Lecount, at that time a midshipman in the royal navy, who recommends that the compasses, when two are used, should never be placed at a less distance than four feet from each other.

CORRIGENDA IN FIRST PART OF VOL. L.

Page 11, 5 *lines from bottom*, *for* height, and place the connecting bar *g*, *read* height and place, the connecting bar *g*.
13, *line* 2, *for* ; then unclamp *read* , first unclamping.
14, 5 and 8, *for b read l.*
— 16, *for* lie *read* lies the bar.
26, 8, *after* grs. *add* of morphia.
33, 16, *dele* working.
39, 3, *for* latter *read* former.
— 10, *after* to *add* air and.
53, 8, 11, 27, 31, *for* bar or bars *read* arm or arms.
— 14, *for* 2 *read* 1.
55, 21, *dele* subsequently.
57, 14, *dele* and.
58, 3 *from bottom, for c c*, which is a front, *read* which is a front view, *c c*.
59, 5 *from bottom*, *dele* thrown back and, *and insert the same in the next following line*, *after* compartment.
63, 5, *for* covered *read* high-pressure.
69, 5 *from bottom*, *for* right angles *read* the angle.
84, 9, *after* horns *insert e.*
86, 12 *from bottom*, *dele* (as in figure 15).
90, 1 *and* 2, *omit* alternate.
— 6, *omit* half the planks retain their original thickness, and.
— 9, *omit* half.
91, 6 *from bottom*, *after* separate *add* in perspective.
—, *last line*, *after* Fig. 1 *add* the two other arms of this knee are horizontal, and at right angles to each other, one of them being parallel to the side of the ship, and the other perpendicular to it.
99, *last line*, *for* 1 *read* 2.
100, *line* 1, *for* 2 *read* 1.
108, 6 *from bottom*, *read the first part of this sentence as follows:* A straight bar projects from the hinder part of the plate *f*, and to this is attached a crank *g* in such a position that the end of its lower arm shall move vertically whenever the bar attached to *f* is moved horizontally.
109, 4, *for* ring, *twice repeated*, *read* swivel.
110, 23, *for the sentence* the weight *to* end of *g*, *substitute* the weight *l* on the spindle *i* balances the spiral *m*, the weight *o* on the crank balances the copper plate and horizontal bar, and another weight at the right hand end of the bar *g* (not shewn in the engraving), balances the weight of the wire.
144, 4, *after* entire *add* machine.
155, 11 *from bottom*, *for* shave *read* have.